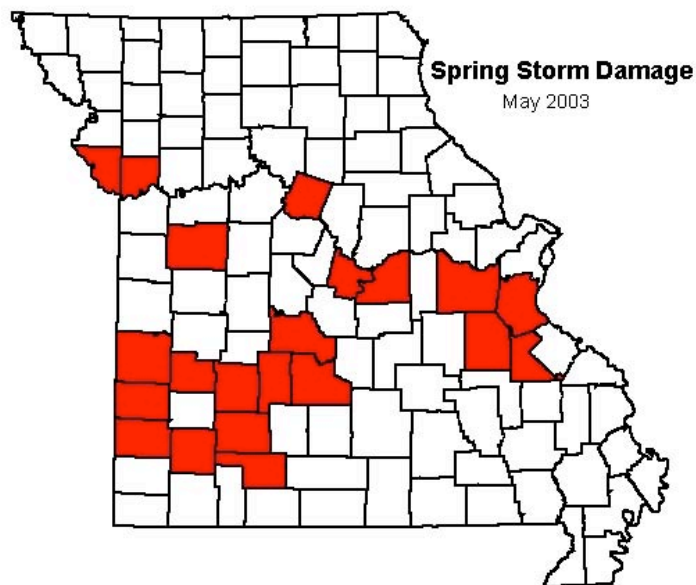


Missouri Forest Health 2003 Highlights

Storm events and drought, two frequent forest health concerns in Missouri, took center stage again in 2003.

Spring Storms

A series of very destructive storms occurred in Missouri during late April and early May. At least 40 tornadoes occurred during May 4-10. The average number of tornadoes in Missouri is 26 per year. The May 4th event was the largest single-day tornado outbreak ever recorded in Missouri (19 tornadoes). Aerial surveys revealed that 27,300 acres of forest land were damaged by tornadoes in western Missouri. The largest areas were near the communities of Stockton (16,220 ac.), Camdenton (4,900 ac.), Pierce City (2,190 ac.), and Liberty (1,850 ac.).



The storms of early May also brought damaging hail and straight-line winds to some areas. Hail completely stripped all foliage from trees in Cole County (3,410 ac.) and Howard County (7,330 ac.) Most hail-damaged trees had reflushed by late June, but new foliage was clumped, poorly distributed in tree crowns, and much reduced in volume from normal conditions. Straight-line winds in eastern Missouri caused extensive damage to 58,580 acres of forest land in Franklin, Jefferson, St. Francois, and Washington Counties.



Tornado damage in western Missouri



Trees completely defoliated by hail
(Cole County, Missouri)

Drought

Northwestern, west central and north central Missouri were hit hard by drought conditions during the past two years. The drought is particularly severe in the northwest, where accumulated 2-year precipitation deficits as of September 2003 approached 25 inches (65% of normal precipitation) in some counties, according to University of Missouri Extension reports. The current drought is the most severe in that region since the drought of 1988-1989. West central Missouri received some relief when remnants of tropical storm Grace dumped heavy rains during August 30-31, but returned to below normal precipitation levels in October and November. Drought conditions continued throughout the fall in the northwest. Even if precipitation levels in the northwest are near normal in early 2004, it is unlikely that winter precipitation will be adequate to replenish water supplies.

Wood Borers and Bark Beetles

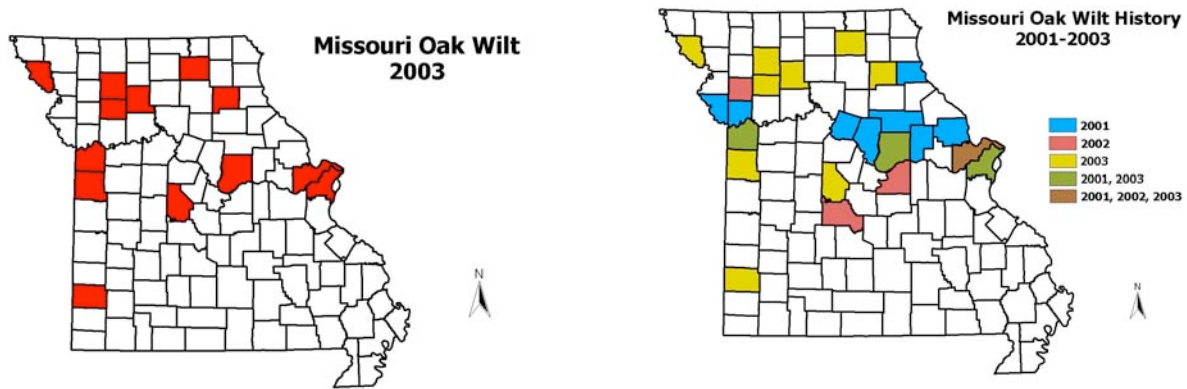
Increased attacks by wood borers and bark beetles can be expected on both hardwood and conifer tree species stressed by drought. Trees growing on thin, rocky soils or in stressful urban settings are particularly at risk. In 2003, many attacks by *Ips* beetles and various wood borers were reported in the Kansas City area on conifers not native to Missouri such as Scots, Austrian, white, red, and jack pines. High numbers of twig girdler attacks were seen on oaks and other hardwoods throughout western Missouri.

Oak Decline

Relatively abundant spring rains fell in southern Missouri in 2003. The increased moisture should be beneficial to declining oaks, but the benefits can be expected to be short-lived. Increasing tree ages, high stand densities, and site conditions will continue to be dominant factors in oak decline for many years. Red oak borers (*Enaphalodes rufulus*), a major contributing factor in oak decline, began adult emergence in the Ozark Highlands in late June and continued through July, completing their two-year life cycle. Missouri Department of Conservation (MDC) researchers operating a black light in southeastern Missouri (Reynolds County) captured about 15 red oak borer adults per hour during trapping sessions on July 16-17.

Oak Wilt

There were 18 confirmed cases of oak wilt caused by *Ceratocystis fagacearum* out of 34 samples sent to the MDC forest health diagnostic lab, up slightly from 2002. Positives for 2003 were taken from Adair, Caldwell, Callaway, Cass, Daviess, Holt, Jasper, Jackson, Livingston, Morgan, St. Charles, St. Louis, and Shelby counties. This diagnostic season included a first positive for a white oak, found in Livingston County.



Spruce Needle Drop

Spruce needle drop (SNEED), *Setomelanomma holmii* M. Morelet, found originally in France, was recently discovered in the United States (Kansas and Wisconsin) and Canada (Ontario) on living twigs of spruce (*Picea pungens* and *P. glauca*). A total of five confirmed cases of SNEED were identified in Missouri occurring in landscape and nursery plantings throughout the state. This disease appears to infect a broad age range of spruce, and is usually found occurring sporadically distributed throughout infected crowns, rather than confined to the lower portions of the tree as seen with other needle diseases.



SNEED symptoms on blue spruce



Ascus of *S. holmii*

Dutch Elm Disease

Two samples from Greene and Callaway Counties were sent to the MDC diagnostic lab for testing for Dutch elm disease (DED) caused by *Ophiostoma ulmi*. Of the two, only the Greene County sample tested positive for DED.

Bacterial Slime Flux

Due to abundant spring moisture in some parts of the state, numerous reports of “slime-flux” were given for many older landscape white oaks. Several homeowners noted the fruity smell associated with the flux, as well as the unsightly ooze.



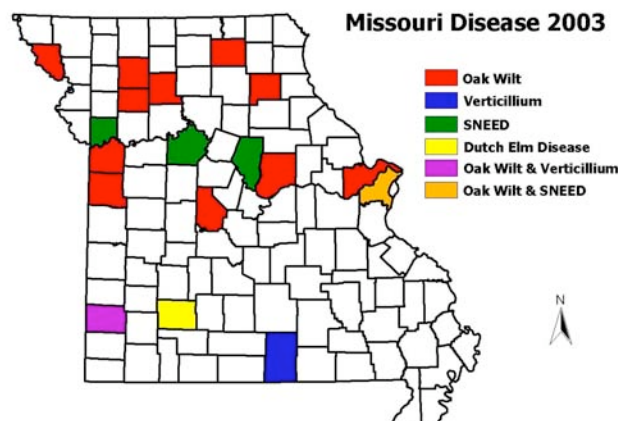
Frothy oozing sap of bacterial slime flux

Maple Anthracnose

Reports of maple anthracnose caused by *Discula campestris* were also up in conjunction with abundant spring moisture on black, red, Chinese, and sugar maples. No significant mortality was reported. If the infection occurred early in the growing season, most trees reflashed and recovered with time

Other Diseases

A number of other diseases were confirmed in 2003 throughout Missouri, including *Verticillium*, ash anthracnose, and *Phomopsis* tip blight on eastern redcedar.



Defoliators

Damage from defoliating insects was noticeably absent throughout Missouri's oak forests in 2003. Lepidopteran populations were very low. Defoliator activity appeared to be even less than what was observed in 2002, which also was relatively low compared to recent years. Causes of low populations are not known, but may be related to poor overwintering survival or impacts related to frequent spring rains in some areas.

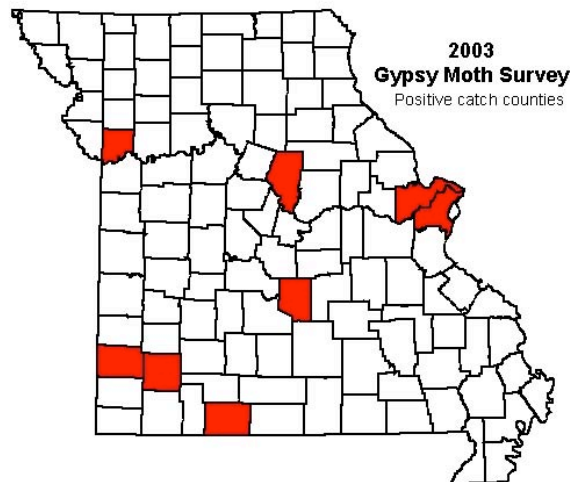
Jumping Oak Galls

Leaf damage on white oaks from the jumping oak gall wasp (*Neuroterus* sp.) returned to eastern and southeastern Missouri after being at very low levels during the past couple of years.

Damage was primarily in widely scattered trees or patches of trees and did not increase to the higher levels seen during the late 1990s.

Gypsy Moth

The Missouri Cooperative Gypsy Moth Survey continued its annual effort to detect the presence of gypsy moths by placing and monitoring more than 11,500 traps throughout the state in 2003. A total of 11 moths were captured statewide. Following the pattern of the last several years, moths were captured in the St. Louis area (four moths in St. Louis County and one in St. Charles County) and near the popular recreation areas of Branson and Table Rock Lake (one moth in Taney County). However, this is the first year since 1999 that gypsy moths were also captured in other widely scattered locations. One moth was captured in Kansas City (Clay County), one in Columbia (Boone County), and one moth each in Jasper, Lawrence, and Pulaski Counties in southern Missouri.



In spite of repeated moth captures in some areas, there are no known populations of gypsy moths in Missouri. Sites where gypsy moths have been captured are surveyed with an increased trap density in the following year. In most cases, survey results in the vicinity of past captures have been negative within one or two years following the original capture. Despite these favorable past results, the risk of gypsy moths establishing in Missouri continues to increase as infested areas in nearby states expand. Statewide gypsy moth monitoring efforts will continue annually.